Math 221

Practice Problems for Exam 1 – Math 221

The exam will cover material *through* §2.3. The homework should be reasonably indicative of the types of problems you may be expected to solve on the exam. Also, you should be able to solve the additional problems listed below.

Suppose that C is a 3×3 matrices. Let E be the appropriate product of elementary matrices that "puts C is reduced row echolon from"; in this case assume $E = \begin{bmatrix} 1 & 0 & -2 \\ 0 & 0 & 1 \\ 3 & -1 & 0 \end{bmatrix}$ and $EC = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$. Form the new 3×5 matrix $A = \begin{bmatrix} & 2 & 1 \\ C & -1 & 0 \\ & 0 & 10 \end{bmatrix}$, and solve the system of equations $A \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = 0$. Be sure to give all of the solutions.

Assume that the trigonometric function f has the following form:

$$f(\theta) = a \sin(\theta) + b \cos\left(\frac{\theta}{2}\right) + c$$

Write down the system of linear equation that a, b and c must satisfy in order that the graph of f pass through the points p and q where p and q are given by:

$$p = (\pi, 0) \text{ and } q = (3\pi/2, 0)$$

Find all of the possible functions f of the given form can one find that pass through p and q.

Decide whether each of the following statement is true or false, and give a brief argument. Remember, to prove that a statement is *false*, it is usually necessary to provide an example.

If A and B are $n \times n$ matrices, $\det(A + B) = \det(A) + \det(B)$.

If A and B are $n \times n$ matrices, $AB = BA$.

If A is a symmetric $n \times n$ matrix, then A^T is also symmetric.

An $n \times n$ matrix A is invertible if and only if $\det(EA) \neq 0$ for any elementary matrix E.

If A and B are symmetric matrices, then AB is a symmetric matrix.

Refer to the following problems from the text.

§1.1: 7
§1.2: 8, 12, 17, 21, 25
§1.3: 12
§1.4: 6
§1.5: 14
§1.6: 15, 17, 25
§1.7: 15, 19
§2.1: 17,13
§2.3: 12, 14, 15, 18

Many of these may have already been assigned.